Hammerhorn Salvage and Restoration Project

Silviculture Report

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For:
Upper Lake Ranger District-Covelo Ranger District
Mendocino National Forest
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1.0 Introduction

The Covelo, and Upper Lake Ranger Districts of the Mendocino National Forest are initiating National Environmental Policy Act (NEPA) analysis for the Hammerhorn Campground Restoration and Salvage Project that lies within the footprint of the 2020 August Complex wildfire that burned from August 16 through November 12 across California's northern Coast Range. Within the Mendocino National Forest, the fire burned more than 612,000 of the forest's 913,300 acres.

The purpose of this project is to improve public safety by removing hazardous trees within the Hammerhorn Campground and along roads within and leading to the project area, salvaging fire killed or fire-damaged trees and preparing the site to re-establish forested conditions. Accomplishing some of this work through a commercial timber sale will allow the forest to achieve its land management objectives in a cost-effective manner that also supports local economies. Funds generated through the commercial sale of fire-damaged timber are directly applied to the area's reforestation

2.0 Regulatory Framework

National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning. The Mendocino National Forest Land and Resource Management Plan, (LRMP) (1995) provides the direction for management activities on the Mendocino National Forest. The plan identifies specific management area direction representing the desired future condition that management actions are designed to achieve. LRMP Management Direction includes Forest Goals, Standards and Guidelines, Management Prescriptions, Management Areas, and Supplemental Management Area Direction. Compliance with this direction is required for any action taken on the Mendocino National Forest.

In addition, National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning. Guidance is provided in Regional Guides, and site-specific planning documents such as this report. Higher-level documents are incorporated by reference and can be obtained from Forest Service offices. Project-specific, planning and environmental analysis applicable to silviculture on NFS lands in the Project area include, but are not limited to, the following:

2.1 Regulatory Acts

- Section 106 of the National Historical Preservation Act of 1966
- The National Environmental Policy Act of 1969
- Clean Air Act (CAA) of 1970
- Section 7(a)(1) of the Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended):
- The Forest and Rangeland Renewable Resources Planning Act of 1974 as amended by the National Forest Management Act of 1976

The National Forest Management Act of 1976 states that "it is the policy of the Congress that all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."

2.2 Forest Service Regulations:

- The Northwest Forest Plan, the Record of Decision (ROD) and Standards and Guidelines (S&Gs) for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (USDA/USDI 1994)

- The 2012 planning rule and directives directs the Forest Service to ensure an adaptive land management planning process that is inclusive, efficient, collaborative and science-based to promote healthy, resilient, diverse and productive national forests and grasslands.

- Forest Service Manual FSM 2470:

  Forest Service Manual 2470 directs that silviculture examinations, treatment diagnosis, and detailed prescriptions be prepared for all forest treatments (USDA 2004b). Forest Service Manual FSM 3400:

  Forest Service Manual 3400 directs that it is the policy of the Forest Service to include forest health considerations in forest resource management planning and decision making. Forest supervisors and district rangers have the responsibility to ensure full consideration of forest health issues in resource management activities.

- The National Fire Plan (USDA and USDI 2000d):

  The National Fire Plan was recommended in a report to the President in September 2000 and subsequently adopted by the Forest Service in conjunction with other federal wildland management agencies and published in the Federal Register on November 9, 2000.

  The purpose of the plan is to:

- Improve the resilience and sustainability of forests and grasslands at risk
- Conserve priority watersheds, species, and biodiversity
- Reduce wildland fire costs, losses and damages
- Better ensure public and firefighter safety

2.3 State Regulations:

Manage National Forest activities to maintain air quality at a level which meets or exceeds State and/or local government regulations.

3.0 Management Prescriptions

Forest management direction is implemented through management prescriptions and adherence to LRMP standards and guidelines. “Management prescriptions provide the linkage between management direction and specific land areas, and they provide

direction in addition to the Forest-wide standards and guidelines" (LRMP, p. IV-55). The LRMP Management Prescriptions for this project include RX 4 – Minimal Management, RX 6 – Late-Successional Reserve, and RX 7 – Timber Modified.

RX 4 – Minimal Management

To achieve the Riparian and Aquatic Ecosystems forest goal, the LRMP has designated Riparian Reserves (RRs) to be managed under the Minimal Management prescription. The LRMP standards and guidelines establish appropriate conditions to allow timber harvest within Riparian Reserves. They are to: "Apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain aquatic conservation strategy objectives" (LRMP, IV-35).

RX 6 - Late-Successional Reserves (LSR)

The purpose of this prescription is to provide for the viability of the northern spotted owl and other species dependent on older mature forested habitats, including, but not limited to, goshawk, marten and fisher.

Silvicultural systems proposed for Late-Successional Reserves have two principal objectives. (1) development of old-growth forest Characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and (2) prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations. Small-scale disturbances by these agents are natural processes and will be allowed to continue. (FSEIS ROD p. B-5)

Note: Within the project area there is one 100-acre LSR, and no specific large land area with the LSR land allocation. The one 100-acre LSR burned at very high fire severity. No late successional habitat remains.

RX 7 - Timber Modified

This prescription provides emphasis on timber production while providing for other resource objectives including visual quality, watershed, rare and endemic species, and wildlife.

The Timber Modified prescription provides management of "capable, available, and suitable timberlands found outside of wilderness, wild & scenic rivers, backcountry areas, RNAs, and riparian reserves" (LRMP, IV-69). The objective for these lands is to manage with an "emphasis on timber production while providing for other resource objectives including visual quality, watershed, rare and endemic species, and wildlife." (LRMP, IV 69). Management Direction for suitable timberland under the Timber Modified management prescription calls for the regulation of "… all timber yields from

suitable timber lands" and to "Intensively manage timber stands for control of competing vegetation, stocking control, etc." (LRMP, IV-70).

3.1 Additional Data Sources

Data used in this analysis included:

Property boundaries

Treatment area boundaries

Project area boundaries

Historic Fire Activity Data Base

Management Area Boundaries

Watershed Analysis report for The Upper Main Fork of the Eel River.

Site visits have occurred throughout the preparation process for the Category Exclusion to assess vegetative conditions. Site visits have included interested members of the public. Site visits were conducted by Forest Service personnel and consulting experts in the following areas: forestry, fire and fuels management, fisheries, hydrology, recreation, scenic management, silviculture and wildlife.

4.0 Resource Indicators and Measures

Number of acres suitable for timber production where forest products are removed to reduce fuels buildup of fire killed or injured trees.

Number of acre suitable for tree planting where forest products are proposed for removal

Table 1: Resource indicators and measures for assessing effects

Resource element	Resource indicator	Measure (quantify if possible)	Source (LRMP S/G; law or policy, BMPs, etc.)?
Fire Killed or Injured Trees	Number of acres where removal of fire killed, or Injured trees reduce future fuel loading	Acres	LRMP S/G; law or policy
Tree Planting	Number of acres identified for Reforestation	Acre	LRMP, Law Regulation or Policy.

5.0 Affected Environment Silviculture/Vegetation

Location: The Hammerhorn Campground Restoration and Salvage Project is located entirely within the Covelo Ranger District. It is about 17miles northwest of Covelo, California and just south of the Yolla Bolly Wilderness (see map). The project is primarily around the Hammerhorn Campground and near Forest Road M21. Under this categorical exclusion commercial treatment units will not exceed a total of 250 acres. These treatments will only be applied to areas that burned at high or very high burn severity. Detailed information is outlined below.

5.1: Vegetation Types:

The Treatment Unit area contained a variety of vegetation types. The Existing Vegetation Database Maps used by the US Forest Service within ArcGIS identified five different vegetation cover types. The treatment unit's acreage and surrounding project area burned under hot, windy conditions creating extensive fire killed dead vegetation. Very few live trees remain.

5.2: Reforestation:

Because only a few trees survived in the treatment units there is a very limited seed sources for natural regeneration. Tree planting is proposed.

5.3 Timber Resource:

Large stands of economically valued tree species such as Douglas-fir were killed in the August Complex. Within two to three years post-fire, these trees lose economic value due to insect damage, staining due to fungal infections, and checking (cracks in the

wood that occur as the burned wood dries). Capturing the value of burned timber enables the National Forest System (NFS) to contribute to local economies, provide wood products to society, and fund needed restoration and hazard reduction activities. Salvage operations are proposed.

5.4 Existing Condition

Treatment Area Vegetation Types

The existing conditions of the vegetative resources are organized around the ecological environments depicted by vegetation type present. The following information is presented for each vegetation type that exists or was present pre-fire within the project area and is addressed in terms of its burn severity which represents the existing conditions.
The Society of American Foresters vegetation cover types present before the fire are as follows: 229- Pacific Douglas Fir, 233- Pacific White Oak, 243-Pacific Nevada Mixed Conifer, 244- Pacific Ponderosa Pine Douglas Fir, 245-Pacific Ponderosa Pine, 249-Canyon Live Oak.

A Map of the described vegetation types in relation to the treatment area can be found Appendix 1, Refer to Table 2 Society of American Foresters Cover Types below.

Table 2 Society of American Foresters Cover Types

Vegetation Type	Code Number	Acres
Pacific Douglas Fir	229	20
Pacific White Oak	233	1
Pacific Nevada Mixed Conifer	243	7
Pacific Ponderosa Pine Douglas Fir	244	191
Pacific Ponderosa Pine	245	30
Canyon Live Oak	249	1

5.5 Post Fire Burn severity

The August Complex fire burned with varying intensity across the landscape. Fire behavior in some locations ranged from creeping and smoldering to group torching, but most of the fire behavior was a fast-moving crown fire. Five mortality classes have been identified and used to describe the post-fire vegetation conditions. These classes are described as follows:

High (Burn severity rates of 50-74 percent basal area loss) result from high severity fire occurring in which the duff and tops of the ground vegetation was nearly all consumed, leaving a quarter or less unburned or lightly burned, and from 5 to 75 percent of the trees were killed. These areas experienced fire intensities that resulted in fire effects ranging from complete crown scorch to consumption of fine twigs and needles on standing trees.

Very High (Burn severity rates of 75-100 percent basal area loss) similar fire effects as experienced under high with up to 100 percent of the trees being killed. Extensive duff and ground vegetation burned to exposed soil conditions.

Change in vegetation structure and species composition within the NSRP area is most prevalent in the very high mortality class. Within the project area, this class accounts for approximately 64 percent of the area. Burn severity resulting in vegetation mortality 75 percent or greater essentially resets the successional stage. Burn severity at this rate effectively removes all mid to late successional habitat leading to the development of new structure of an early successional stage. At this stage grass/forb/ tree or shrub seedling becomes the dominate vegetation. Important to recognize is that the other burn severity classes result in only 12 percent in the high severity class, 12 percent experienced mixed severity, while 6 percent with low severity and 4.8 percent was unburned.

Table 3 represents project area burn severity by burn severity class in term of basal area loss and the number of acres within each class

Table 3: Treatment Area Burn Severity by Burn Severity Class and Acres

Burn Severty Classes	Acres	Percent of Project Area
No Loss 0%	12	5
Low 0-24%	17	6
Mixed 25-49%	30	12
High 50-74%	31	12
Very High 75-100%	160	64

5.6 Soils Information

The Soil Survey of Mendocino County, California classified seven complexes associated with the salvage treatment units Soil complexes for the treatment area are shown in figure 6, as well as the following table 6.

6.0 Desired Condition

The desired future condition (DFC) is a resilient landscape with a mix of species composition, structure, and function that ensure long-term sustainability, forest growth and productivity, and resistance and resilience to stressors (e.g., climate change, fire, pathogens) as required by National Forest Management Act (NFMA), Land and Resource Management Plan (LRMP), Forest Service policy, and the 2012 planning rule and directives to ensure an adaptive land management planning process that is inclusive,

efficient, collaborative and science-based to promote healthy, resilient, diverse and productive national forests and grasslands.

The vegetation resource desired condition will follow the appropriate management prescription for the Buck management area associated with the project area.

7.0 Identification of Lands

Identification of lands generally suitable for timber harvest and timber production is made at the land management plan level; however, these identifications are estimates that are validated at the project level (36 CFR 219.12(a)(2)(D)(ii). Project-level suitability determinations were made during silvicultural diagnoses; final suitability determinations on lands proposed for commercial timber harvest would be documented in a site-specific silvicultural prescription prepared or reviewed by a Certified Silviculturist.

Timber harvest on lands not suitable for timber production can occur when harvest is necessary or appropriate for other multiple use purposes and to achieve the desired vegetation conditions (16 USC 1604 (k), 36 CFR 219.12(a)(2)(D)(ii)). This is consistent with 16 USC 1604 (k) and 36 CFR 219.12(a)(2)(D)(ii) the implementing regulations of the National Forest Management Act of 1976.

Reforestation is a suitable project for forest land restoration to promote future ecological services.

8.0 Environmental Consequences

8.1 Methodology

The methods, information sources, science and assumptions that are used for the analysis in this report are noted in individual sections of the report.

Current condition data for the potential salvage, reforestation and fire and fuels operations were derived from the Rapid Assessment of Vegetation Condition after Wildfire (RAVG) program which assesses post-fire vegetation condition for large wildfires on forested National Forest System (NFS) lands RAVG information is used to assist in post-fire vegetation management planning. The information is intended to enhance decision-making capabilities and reduce planning and implementation costs associated with post-fire vegetation management.

8.2 Spatial and Temporal Context for Effects Analysis

The entire project area was used as the analysis area for the vegetation resource direct, indirect, and cumulative effects. Measurement indicators will serve to guide the analysis. Vegetation treatment effects will be analyzed at the treatment prescription level. Second, the cumulative effects analysis will include discussion on events relative to

vegetation management that occurred on all National Forest System (NFS) lands within Project area. The temporal scale of this analysis ranges from short to long term. The duration of the short-term effects is up to about 10 years from the implantation of the treatments. Long-term effects are those effects that exceed 10 years from implementation and may extend to at least 30 years.

8.3 Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

For cumulative effects on Vegetative resource in the project area, past, current, and reasonably foreseeable future events include past forest management and past wildfires, the 2020 August Complex Fire, and other future forest management activities. These actions would add cumulatively to the potential direct and indirect effects of the action alternatives.

The Council on Environmental Quality's (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) define cumulative effects as the environmental impact that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

9.0 Proposed Action

The proposed action includes:
Salvage of dead and dying trees. from five treatment units including portions along roads and within the Hammerhorn Campground.

- Site Preparation.
- Planting trees.

Site Preparation can include:

- Prescribing fire.
- Hand and Mechanical piling of debris followed by pile burning.

10.0 SILVICULTURAL PRESCRIPTIONS

The following information provides more detail about what's entailed within the proposed action as related to the project's Silvicultural prescription. Treatments will include sale of merchantable, site preparation for planting and reforestation design.

10.1 Sale of merchantable timber:

This project proposes making merchantable dead or fire -damaged trees on up to 250 acres in the vicinity of the Hammerhorn Campground available for sale. Salvage

operations will be conducted on matrix (Rx7), riparian reserve (Rx4) and 100 acre late successional reserves (Rx6) (USDA 1995) land allocations.

- Matrix land (RX 7 -Timber Modified)
    - Refer to Post Treatment Snag Retention guidelines described below.
    - Refer to Post Treatment Coarse Woody Debris guidelines described below.
    - Avoid extended skids (100 feet or more) across slopes steeper than 35 percent.
    - Ground based timber harvesting systems are proposed for areas that have existing harvest systems in place.

  Riparian Reserves (RX 4 -Minimal Management)
    - Refer to Post Treatment Snag Retention guidelines described below.
    - Refer to Post Treatment Coarse Woody Debris guidelines described below.
    - Directional felling will be used to protect streambanks.
    - Maintain CWD in concentrations that do not create an unacceptable fire hazard.
    - Timber harvesting salvage operations will take place in Riparian Reserves.
    - SMZ's will be established as equipment exclusion zones.

- 100 Acre LSR (RX 6 -Late-Successional Reserves)
    - Refer to Post Treatment Snag Retention guidelines described below.
    - Refer to Post Treatment Coarse Woody Debris guidelines described below.
    - Protect existing hardwood stump sprouts where possible.
    - Prohibit extended skids (100 feet or more) across slopes steeper than 35 percent.
    - Long lining tractor harvesting systems from existing roads may be used.

- Harvesting of trees would follow the 2011 "Tree Marking Guidelines for Fire-Injured Trees," including the 2021 addendum. Guidelines were developed by the regional headquarters' Forest Health Protection unit. the removal of all fire killed trees 14" DBH or greater will be determined by probability of mortality.

- The probability of mortality rating is a number between 0 and 1, where, roughly speaking, 0 indicates impossibility and 1 indicates certainty expressed as a numerical description of how likely a tree is to die. The higher the probability, the more likely the tree will die.

- The project consists of 5 different units. Unit 1, which includes the Hammerhorn campground area will have trees harvested that fall within the 70% mortality chance of dying class. Units 2, 3, 4, 5 will have roadside trees harvested that fall within a 70% chance of mortality of dying class. Trees not associated with campground or roadside areas will be harvest when they have no live crown remaining (100% mortality class).

- The Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) with the 2021 addendum explain how to determine the probability of mortality

for different species. Marking Guidelines for Fire-Injured Trees in California is in the project record.3

- Hazard Tree Abatement: Hazardous tree removal along roads within and leading to the project area: Trees will be cut and either sold when associated with a salvage sale unit, left in place, or moved to an area that will not affect the safety of visitors, employees, or log truck traffic.

- Hazard trees outside of the salvage units will not be sold. The hazard trees outside of the salvage units will be cut if 1 tree length away from the road. Hazard tree making guidelines are included as part of the project record.

- Post treatment Snag retention guidelines. Some fire killed trees will be retained to serve as snags for wildlife habitat. Where green trees remain, they will be kept as seed sources for natural regeneration, shade, or legacy remnants wildlife proposes. Trees reserved for habitat and propagation purposes will be marked for retention.

    - Retain fire killed conifer trees for snag retention at a rate of four of the largest snags per acre averaged over 40 acres of matrix area. Trees retained for snags maybe either Douglas-fir, ponderosa, or sugar pine where possible two of the four trees retained for snags should be Douglas-fir as Douglas-fir generally has a longer retention time frame. Cluster snag trees where such natural clumps of the largest trees in the stands occur, and scatter others where stands are more uniform in size. Retained snags maybe hard (recently killed) and soft (older, rotten, structurally weakened) snags where they are not a current or potential future safety or fuel hazard.

    - Use variable spacing if possible, in distributing snags to mimic natural stands. Snag spacing can be applied with flexibility to ensure that the most highly desired snags are retained. To maintain diversity and to avoid single tree species retention, the species type retained would be in the same proportion as the species that occur naturally in the project area.

    - Retain all hardwood snags, particularly black oak snags over 12” DBH if they do not pose a safety or fuels hazard.

- Note: Snag guidelines have been developed following guidance from Table 4 Snag retention guidelines from the Mendocino Land and Resource Management Plan 1995 for Montane Conifer. The marking guidelines require that the largest snags per acre (4 snags Rx7, 4 snags Rx6 and 4 snags Rx4) averaged over forty acres be retained. This could result in some units having a cluster of the largest snags in pockets.

Table 4. Snag Retention Guidelines from the Mendocino Land and Resource Management Plan 1995 for Montane Conifer

TYPE: Montane Conifer 1/			
HABITAT VARIABLE	**HIGH** (Optimum)	**MODERATE** (Sub-optimum)	**LOW** (Marginal)
Average density			
…15-24" DBH	>3.0/acre	1.2-3.0/acre	<1.2/acre
…>24" DBH	>0.5/acre	0.2-0.5/acre	<0.2/acre
…Total	>3.5/acre	1.43.5/acre	<1.4/acre
	(max = 10/acre)	(max = 5/acre)	(max = 3/acre)
Height	>40 feet	20-40 feet	<20 feet
Dispersion	One group per 5 acres or less, with 15+ snags	One group per 5-15 acres, with 5-15 snags	Even dispersion
Hard: Soft Ratio	>3:1	2:1-3:1	<2:1
Location	Edges of meadows, brush fields, streams, and other water	Throughout wooded stands	Rocky, open slope, Barren areas
Species	Douglas fir, Ponderosa pine, Sugar pine, Knob cone, Black oak, Blue oak, Madrone	Douglas fir, Ponderosa pine, Black oak	Douglas Fir, Black oak

- Post Treatment Coarse Woody Debris guidelines. Where large coarse woody debris (downed logs) are lacking, some fire killed trees will be utilized to meet wildlife habitat requirements. Created woody debris and litter may be distributed throughout the treatment area to reduce erosion, as well as create microsites for planting and natural regeneration.
    - Maintain CWD in concentrations that do not create an unacceptable fire hazard.
    - Maintain a minimum of 5 to 20 tons per acre of course woody debris comprised of a minimum of four recently downed logs per acre, averaged over 40 acres of matrix area. When present focus retention on logs equal to or greater than 20 inches in diameter (large end), or the largest diameter logs available. Retained logs should range from 15 to 20 feet in length, with one log per acre greater than 20 feet in length. Where course woody debris CWD is deficit, defer Yarding of Unutilized Material (YUM) within the unit until required numbers and size classes are met.
    - All coarse woody debris (CWD), greater than 20 inches in diameter at the large end and 10 or more feet in length (preferably over 20 feet), would be protected during harvest operation, fuels treatments and site preparation. If the amount of larger coarse woody debris (greater than

20 inches in diameter at the large end) is abundant enough to cause a hazardous fuels condition, a portion of these logs may be treated/removed. Remove the smallest logs first until fuels objectives are met. Retain the maximum number possible while still meeting fuels objectives.

- Designated salvage units would be located on average slopes less than 36 percent and away from inner gorges and unstable areas to minimize erosion. Harvested timber would be skidded to designated landing and access roads.

  Tree species subject to removal through the timber sale include ponderosa pine, sugar pine, white fire, incense cedar, and Douglas-fir. Broadleaf trees, such as black oak white oak, and live oak as well as species associated with riparian areas, such as California bay laurel, bigleaf maple, willow, and white alder, would not be removed unless they pose a safety or fuels hazard.

10.2 Site Preparation Hazardous Fuels Treatment.

Salvage units fuel reduction action shall be applied to fire killed or injured trees not suitable for inclusion in a Salvage sale. Treatment will be applied to trees that depending on market conditions may have value as biomass products, but do not have a commercial value as lumber products. Application may occur as a combination of prescribed burning, hand or mechanical harvesting, hand or mechanical piling, chipping, pile burning, or biomass removal. To reduce activity fuels, other surface fuels, and maintain them in the desired condition, prescribed fire may follow treatment.

Dead and dying trees would be removed in preparation for planting. Removal of trees could be accomplished by several means, such as cutting and removal of fuels or making merchantable timber available through a timber sale. Treatment include:

- Reducing hazardous fuels
- Reducing competition to the newly planted or naturally regenerated seedlings.
- Site preparation may be completed with both mechanized and hand treatments.
- Leave enough material on the sites to provide microsites favorable for seedling survival. This includes down woody debris, standing snags, high stumps, and other features which create shade or help to reduce surface temperatures and increase the water holding capacity of the site.
- All treatments will comply with BMP's and other design features described in the Hydrology report.

10.3 Reforestation

About 250 acres within the project area are slated for reforestation. These areas are dominated by high fire severity burn patches that resulted in 98 percent or greater tree mortality or vegetation coverage loss, as measured by basal area from pre-fire conditions.

Because of the large size of these patches and the intensity of the fire, few live trees are available to naturally reseed the area.

Planting of seedlings would be concentrated in areas cleared of standing dead trees. Tree density and species composition would be determined based on land allocation and area topography. Seedlings of species most suitable for the area would be planted. Naturally sprouting hardwood species would be protected during planting as would riparian tree and shrub species, such as California bay laurel, bigleaf maple, willow, white alder, and elderberry.

Reforestation shall be accomplished by low density planting with variable arrangement and species mix.

Trees will be planted using one of three methods: Individual tree planting 14 feet x 14 feet spacing, clustered tree planting, or a combination of the two methods

10.4 Individual Tree Planting:

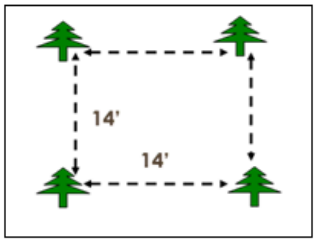

Figure 1. INDIVIDUAL TREE DIAGRAM

If natural regeneration, defined as any later seral conifer species (Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir, or hardwood stump sprout or seedling is on the site they will be incorporated into the planting design.

10.5 Cluster Planting:

Cluster planting will have three trees planted approximately 10 feet apart (distance selected randomly within this 10 ft radius) and the clumps will be an average of 25 feet apart depending on site conditions including the amount of ground which can be planted, any existing natural regeneration, and residual trees. If natural regeneration, defined as any later seral conifer species (Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir, or red fir) or hardwood stump sprout or seedling is on the site they will be incorporated into these clusters.

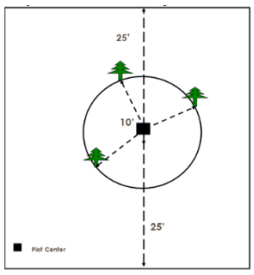

Figure 2. Cluster Diagram

10.6 Planting Technique

All planted seedlings will have scalps dug at the time of planting and holes will be dug using either hand-held power augers or hand tools. Other standard planting, release, and thinning practices will apply.

10.7 Release:

After successful reforestation seedlings and natural regeneration may need to be released from competition where necessary to promote survival and growth of seedlings. This will be determined through on-site monitoring efforts.

Within the first 1-3 years planted areas will be monitored to determine the need for competing vegetation control. Potential treatment will involve, hand or mechanical grubbing of grasses and other competing vegetation away from the trees in a 5-foot radius circle. (Refer to Figure 4)

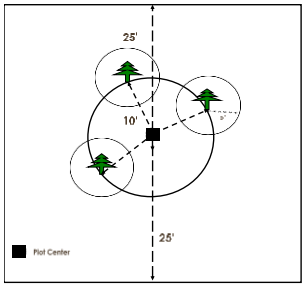

Figure 3. Ten Foot Diameter Treatment Area around Each Cluster Planted Tree

10.8 Monitoring:

Monitor to determine if seedling densities of both natural and planted seedlings meet desired stocking levels. If not, sites should then be replanted and determine any adjustments necessary to correct problems which may have led to the failure of the first planting.

- Monitor planting to determine if there is a need for additional release treatments. Additional release treatments may occur if shrubs and competing natural regeneration require removal to promote survival and growth.
- Monitor to determine future pre-commercial thinning treatment needs.
- Monitor to determine if conifer species are unable to be regenerated due to climate factors or drought conditions,
- Monitor to determine if hardwoods may be substituted when conditions of climate change or drought affect successful conifer regeneration.
- Young trees may be thinned to densities best suited to meet project objectives and forest management plans.

10.9 Monitor to determine pre-commercial thinning needs

Planting densities have been designed to develop today the forest of tomorrow. This premise should limit the need for extensive pre-commercial thinning. However, should monitoring activities indicate pre-commercial thinning activities are necessary, stands will be evaluated for pre-commercial thinning. Cutting of trees shall be limited to trees less than or equal to 12 inches DBH, except in cases of safety, where a leaning or damaged tree must be cut to permit safe treatment Target conifer leave trees should generally be the healthiest trees, favoring those species best suited to the site. Trees larger than 12 inches DBH that have commercial value should be removed in a future commercial entry or retained for wildlife habitat. Stem densities should be reduced to around 100 to 150 conifer stems per acre when present. In addition to conifers, a target of twenty to thirty black oak stems per acre, where available, will provide for a more diverse and heterogynous stand. In the event that conifer species are unable to be regenerated due to climate factors or drought conditions, additional hardwood may be substituted.

Thinning will space trees out and reduce fuel hazards within the stands. This will also increase individual tree growth and vigor, facilitating the stands to quickly develop towards older forest characteristics.

11.0 Direct Effects Proposed Action

11.1 Fire Killed or Injured Tree Removal:

The beneficial effects by acting to reduced fire killed trees, fuel loads, competing vegetation will last for many decades. Not addressing the fire killed trees in this area could impede recreation as well as pose direct safety risks to the public who recreate or occupy adjacent property and Forest Service personnel who work in this high use areas.

The removal of fire killed trees will assist reforestation operations by eliminating fire kill trees from becoming hazards that would prevent planting operations. Planting with a mix of species will assist forest restoration to develop a varied species composition forest. The severity of the wildfire left a substantial portion of the project area without an immediate or nearby seed source for natural reforestation.

Review of fire history database concludes only one fire had occurred prior to the August Complex. Fire exclusion and the lack of density management in the post-harvest regeneration areas developed conditions that lead to the high to very high basal area loss. Treatments will reduce fuel loading so that future disturbances, natural or human caused will not lead to uncharacteristic wildfire.

Refer to Table 5: Direct Effects on Vegetation and Mitigation of Adverse Effects Occurring in the Near-Term.

Table5: Direct Effects on Vegetation and Mitigation of Adverse Effects Occurring in the Near-Term.

Treatment	Vegetation Effects	Beneficial and / or Adverse	Mitigation of Adverse Effects
Salvage Harvesting	Lower Fuel Loads.	Beneficial /Adverse[1]	Snag and CWD retention guidelines, Fire marking guidelines, no equipment in stream management zones (SMZ).
	Establishes standards for Coarse woody debris (CWD) and snag recruitment		
	Reduce potential fuel loading from fire killed trees		
	Reduced health risk to residual trees		
	Fewer Snags		
	Reduced Hazard Trees		
Site Preparation	Fuel reduction /competition control	Beneficial /Adverse[2]	Avoid areas with natural regeneration, follow compaction mitigation measures in Hydrology Report
Reforestation	Establishes seedling in areas which lack a conifer or hardwood seed source. Accelerated growth of planted seedlings or natural regeneration of major forest species	Beneficial /Adverse[3]	Release and Thinning Treatments

The Hammerhorn Campground Restoration Project proposal would result in 250 acres of salvage harvest operations. The duration of that harvest should be completed within 3 years of the fire event. The harvest would produce a spike in surface fuel loading across the immediate area effected by the harvest, most of which due to broken branch wood in transporting logs to the processing deck. Due to decomposition, the increase in fuel loading versus not logging, reaches an equilibrium duration between seven to ten years. Some tops and branches may deliberately be left on site due to needs for duff recruitment, in which case those sites may see a longer duration of increased fuel

[1] Fewer snags are both beneficial and adverse. Fewer snags would reduce fuels and allow for reforestation efforts. However, it also can reduce site quality, future down wood recruitment, and wildlife habitat.

[2] Site preparation will benefit reforestation efforts by making sites easier for crews to plant as well as controlling competition. Adverse effects include compaction and damage to natural regeneration.

[3] Reforesting sites is beneficial, however can lead to future fuels hazards. This will be mitigated through future release, thinning and prescribe fire activities.

loading until that material breaks down to duff. After the initial increase, the areas affected by harvest have a net result (sum of all fuel size classes) less fuel loading due to harvest versus not harvesting. Not harvesting continues to build excessive fuel loads for 30 years before starting a gradual decline.

11.2 Reforestation:

The effect of reforestation with a combination of individual tree planting and cluster planting configuration will serve to help develop a random distribution of trees and create spatial heterogeneity. Historically, western mixed-conifer forested landscapes develop a stand structure as a result of natural mixed-severity fire regimes with large individual trees, tree groups of varying sizes, and intervening gaps. Recent articles) conclude that traditional planting in a high-density grid like pattern fails to produce both the spatial pattern that recent research has suggested is associated with greater fire and drought resilience, and the diversified structure that is optimal for wildlife habitat and species diversity. The proposed cluster pattern at low trees per acre density compared to traditional numbers of trees per acre leaves room for openings to develop, and room for occupation by shrubs and other forms of vegetation. Depending on how successful the planted trees survive there is a possibility that the stand will develop with individual trees, tree groups of varying sizes, and intervening gaps.

This stand structure is referred by (Churchill et al, 2013) as individual trees (I), clumps (C), and openings (O), or as an acronym ICO. Developing this ICO structure deviates from the traditional approach of full site occupancy by conifer species but does not alleviate the need for follow up treatments. When planted trees are more widely spaced, drought stress can be exacerbated by the rapid growth of shrubs and grasses in the high-light environment between trees and increase competition for nutrients and soil moisture, (Lanini and Radosevich, 1986; Riegel et al., 1995; McDonald and Fiddler, 2010; Bohlman et al., 2016). Competing vegetation will require some form of manually or mechanically reduction.

By removing this competing vegetation directly around seedlings there is less competition for water to the seedling and will allow the trees to grow deeper roots than the surrounding herbaceous competition, thereby improving survival rates and growth of the seedlings.

12.0 Indirect Effects (Proposed Action)

The proposed actions will allow sites to progress towards developing future forestland within the very high severity fire areas and protect moderate to low severity fire areas given the disturbance history of this area (Refer to Fuels Report). The action is planned to accelerate development of subsequent stands, develop coarse woody debris management, and to bridge to the extent possible maintenance of structural wildlife habitat until future stand development can provide natural development of structural habitat.

Salvage harvesting of these stands along with subsequent site preparation and reforestation treatments will allow for establishment of once dominate forest tree species back on these sites as well as facilitate the growth and development of these stands towards forested habitat. The treatments in Matrix areas will capture economic value as well as meet objectives for wildlife and other uses while reestablishing productive timber stands back on these sites. The objective of hazard tree reduction is increased user and employee safety. Safety will be met through a reduction in the number of current and potential future hazard trees. Trees will be cut and either sold when associated with a salvage sale unit, left in place, or moved to an area that will not affect the safety of visitors or log truck traffic.

13.0 Cumulative Effects

The analysis boundary for the cumulative effects of vegetation of the silvicultural treatments is based on the geography and vegetative cover within the project area.

Project actions will cause slight, localized, short-term increases in fine surface fuel accumulations, especially in areas where cover is needed to protect exposed soils. However, total onsite biomass will be reduced in the short term, thus overall, less fuel would be available to burn in a wildfire situation. Additionally, the limited scope of salvage activities would not alter future fire behavior across the landscape. When combined with past, present and foreseeable future activities project activities would not contribute to cumulative effects to future fire behavior and would not increase the risk of severe fire.

Prior to the August Complex Fire, silvicultural activities within the Hammerhorn project area have cumulatively not led to an additive effect from past, present, and reasonably foreseeable future landscape and stand conditions. The August Complex Fire impact altered the treatment area and most of the surrounding landscape and these altered stand conditions will impact the stands into the foreseeable future. Currently, within the project area there are no foreseeable future activities or additional future projects proposed relevant to cumulative effects analysis.

14.0 Monitoring

Implementation and effectiveness monitoring would be conducted under this project to:

- determine whether the original objectives of the activities are met.
- determine the need for additional action; and,
- educate and assist in the design in future projects.
- Monitoring of the vegetation treatment activities implemented under contract would occur during and immediately following contract implementation.
- Timber sale administration all preparation and subsequent project- associated operations would be monitored by Forest Service representatives to ensure compliance with specifications.
- Monitor key processes such as mortality, regeneration, growth, fuel accumulation, and new species colonization to inform future management decisions.

- All sites with planting or prescribed natural regeneration would be surveyed after the 1st, 3rd, and 5th growing seasons or until certified as adequately stocked.

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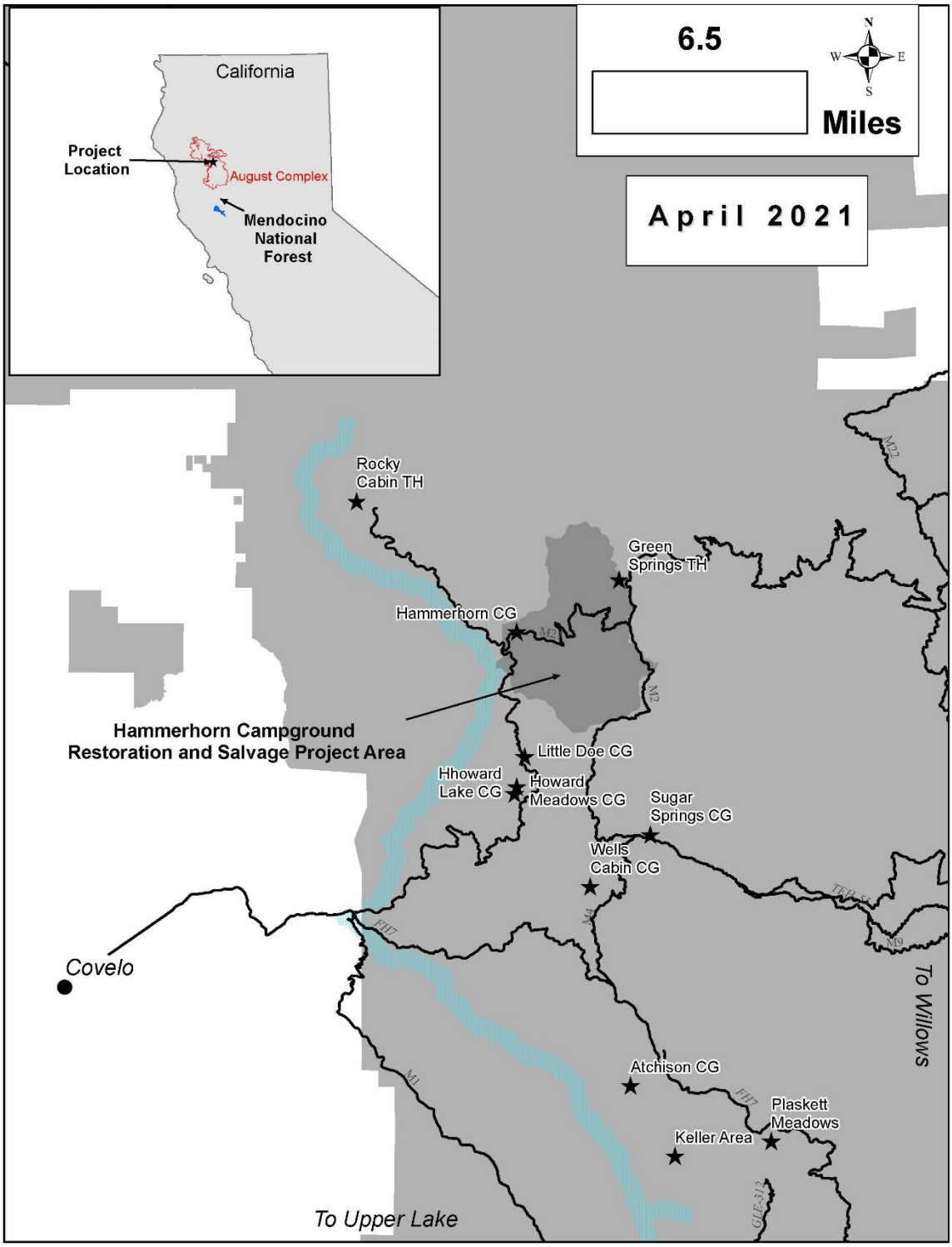
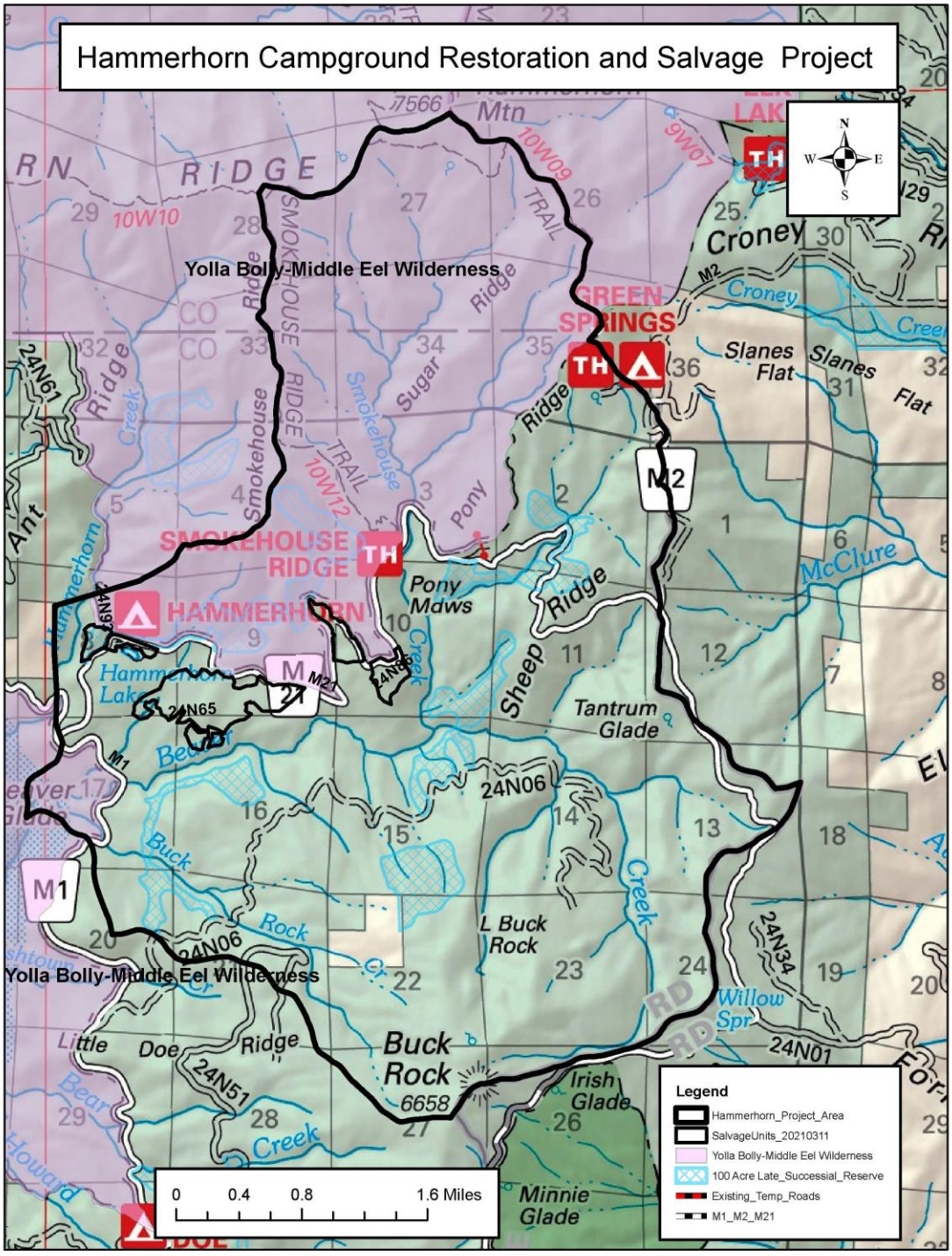
Appendix I Maps

General Location Map

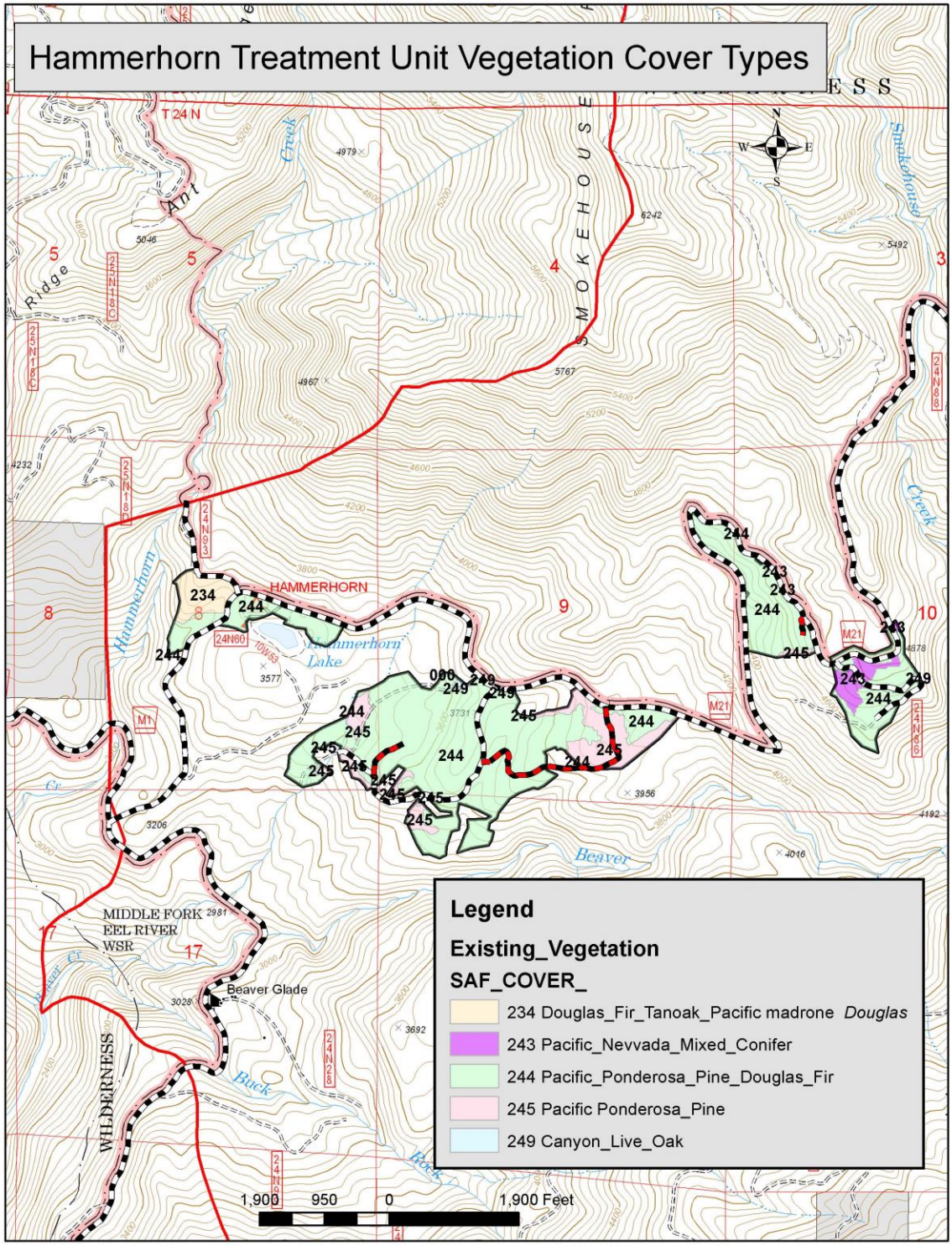


Hammerhorn Campground Restoration and Salvage Project Map

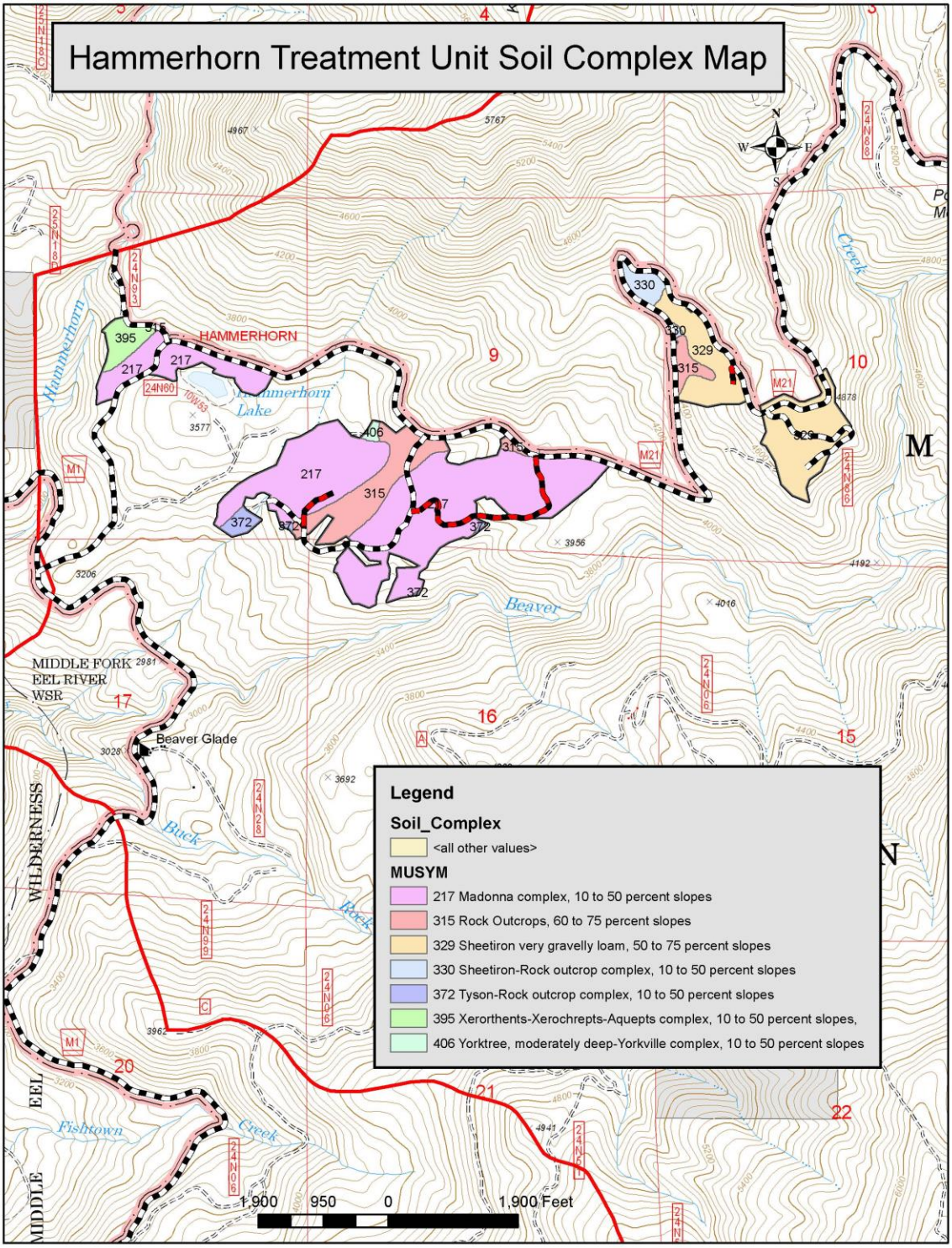


Hammerhorn Campground Restoration and Salvage Project Treatment Unit Map

Hammerhorn Campground Restoration and Salvage Project Vegetation Cover Type Map



Hammerhorn Campground Restoration and Salvage Project Soil Complex Map



Appendix 2 Hammerhorn Marking Guides

Hammerhorn Marking Guides for the Salvage timber harvest of fire killed and injured (dying) trees, site preparation, and reforestation will comply with the following marking guides.

Salvage Operation:

- This project proposes making merchantable dead or fire -damaged trees on up to 250 acres in the vicinity of the Hammerhorn Campground available for sale. Salvage operations will be conducted on matrix (Rx7), riparian reserve (Rx4) and 100 acre late successional reserves (Rx6) (USDA 1995) land allocations. Designated salvage units would be located on average slopes less than 36 percent and away from inner gorges and unstable areas to minimize erosion. Harvested timber would be skidded to designated landing and access roads.

- Matrix land(RX 7 -Timber Modified)
    - Refer to Post Treatment Snag Retention guidelines described below.
    - Refer to Post Treatment Coarse Woody Debris guidelines described below.
    - Avoid extended skids (100 feet or more) across slopes steeper than 35 percent.
    - Ground based timber harvesting systems are proposed for areas that have existing harvest systems in place.

Riparian Reserves (RX 4 -Minimal Management)
    - Refer to Post Treatment Snag Retention guidelines described below.
    - Refer to Post Treatment Coarse Woody Debris guidelines described below.
    - Directional felling will be used to protect streambanks.
    - Maintain CWD in concentrations that do not create an unacceptable fire hazard.
    - Timber harvesting salvage operations will occure in Riparian Reserves.
    - SMZ's will be established as equipment exclusion zones.

- 100 Acre LSR (RX 6 -Late-Successional Reserves)
    - Refer to Post Treatment Snag Retention guidelines described below.
    - Refer to Post Treatment Coarse Woody Debris guidelines described below.
    - Protect existing hardwood stump sprouts where possible.
    - Prohibit extended skids (100 feet or more) across slopes steeper than 35 percent.
    - Long lining tractor harvesting systems from existing roads may be used.

- Harvesting of trees would follow the 2011 "Tree Marking Guidelines for Fire-Injured Trees," including the 2021 addendum. Guidelines were developed by the regional headquarters' Forest Health Protection unit. the removal of all fire killed trees 14" DBH or greater will be determined by probability of mortality.

- The probability of mortality rating is a number between 0 and 1, where, roughly speaking, 0 indicates impossibility and 1 indicates certainty expressed as a numerical description of how likely a tree is to die. The higher the probability, the more likely the tree will die.

- The Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) with the 2021 addendum explain how to determine the probability of mortality for different species.

- The project consists of 5 different units. Unit 1, which includes the Hammerhorn campground area will have trees harvested that fall within the 70% mortality chance of dying class. Units 2, 3, 4, 5 will have roadside trees harvested that fall within a 70% chance of mortality of dying class. Trees not associated with campground or roadside areas will be harvest when they have no live crown remaining (100% mortality class).

- Post treatment Snag retention guidelines. Some fire killed trees will be retained to serve as snags for wildlife habitat. Where green trees remain, they will be kept as seed sources for natural regeneration, shade, or legacy remnants wildlife proposes. Trees reserved for habitat and propagation purposes will be marked for retention.

    - Retain fire killed conifer trees for snag retention at a rate of four of the largest snags per acre averaged over 40 acres of matrix area. Trees retained for snags maybe either Douglas-fir, ponderosa, or sugar pine where possible two of the four trees retained for snags should be Douglas-fir as Douglas-fir generally has a longer retention time frame. Cluster snag trees where such natural clumps of the largest trees in the stands occur, and scatter others where stands are more uniform in size. Retained snags maybe hard (recently killed) and soft (older, rotten, structurally weakened) snags where they are not a current or potential future safety or fuel hazard.

    - Use variable spacing if possible, in distributing snags to mimic natural stands. Snag spacing can be applied with flexibility to ensure that the most highly desired snags are retained. To maintain diversity and to avoid single tree species retention, the species type retained would be in the same proportion as the species that occur naturally in the project area.

    - Retain all hardwood snags, particularly black oak snags over 12” DBH if they do not pose a safety or fuels hazard.

- Post Treatment Coarse Woody Debris guidelines. Where large coarse woody debris (downed logs) are lacking, some fire killed trees will be utilized to meet wildlife habitat requirements. Created woody debris and litter may be distributed

throughout the treatment area to reduce erosion, as well as create microsites for planting and natural regeneration.

- Maintain CWD in concentrations that do not create an unacceptable fire hazard.

- Maintain a minimum of 5 to 20 tons per acre of course woody debris comprised of a minimum of four recently downed logs per acre, averaged over 40 acres of matrix area. When present focus retention on logs equal to or greater than 20 inches in diameter (large end), or the largest diameter logs available. Retained logs should range from 15 to 20 feet in length, with one log per acre greater than 20 feet in length. Where course woody debris CWD is deficit, defer Yarding of Unutilized Material (YUM) within the unit until required numbers and size classes are met.

- All coarse woody debris (CWD), greater than 20 inches in diameter at the large end and 10 or more feet in length (preferably over 20 feet), would be protected during harvest operation, fuels treatments and site preparation. If the amount of larger coarse woody debris (greater than 20 inches in diameter at the large end) is abundant enough to cause a hazardous fuels condition, a portion of these logs may be treated/removed. Remove the smallest logs first until fuels objectives are met. Retain the maximum number possible while still meeting fuels objectives.

Site Preparation.

Salvage units fuel reduction action, as required for site preparation, shall be applied to fire killed or injured trees not suitable for inclusion in a Salvage sale. Treatment will be applied to trees that depending on market conditions may have value as biomass products, but do not have a commercial value as lumber products.

Application may occur as a combination of:

- prescribed burning,
- hand or mechanical harvesting,
- hand or mechanical piling,
- chipping,
- pile burning, or
- biomass removal.

To reduce activity fuels, other surface fuels, and maintain them in the desired condition, prescribed fire may follow treatment.

- Leave enough material on the sites to provide microsites favorable for seedling survival. This includes down woody debris, standing snags, high stumps, and other features which

create shade or help to reduce surface temperatures and increase the water holding capacity of the site.

- All treatments will comply with BMP's and other design features described in the Hydrology report.

Reforestation

About 250 acres within the project area are slated for reforestation.

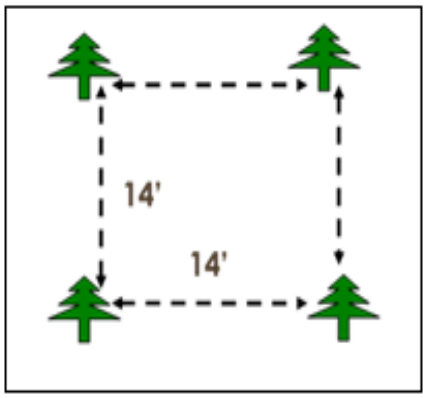
Planting of seedlings would be concentrated in areas cleared of standing dead trees. Tree density and species composition would be determined based on land allocation and area topography. Seedlings of species most suitable for the area would be planted. Naturally sprouting hardwood species would be protected during planting as would riparian tree and shrub species, such as California bay laurel, bigleaf maple, willow, white alder, and elderberry.

Reforestation shall be accomplished by low density planting with variable arrangement and species mix

Trees will be planted using one of three methods: Individual tree planting 14 feet x 14 feet spacing, clustered tree planting, or a combination of the two methods

Individual Tree Planting:

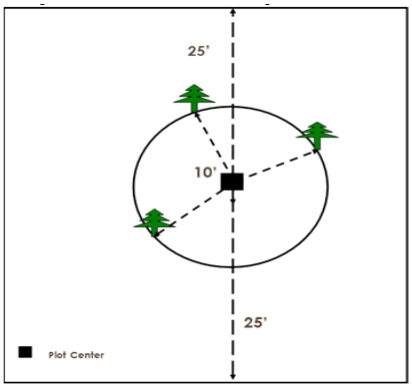
INDIVIDUAL TREE DIAGRAM



If natural regeneration, defined as any later seral conifer species (Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir, or hardwood stump sprout or seedling is on the site they will be incorporated into the planting design.

Cluster Planting:

Cluster planting will have three trees planted approximately 10 feet apart (distance selected randomly within this 10 ft radius) and the clumps will be an average of 25 feet apart depending on site conditions including the amount of ground which can be planted, any existing natural regeneration, and residual trees. If natural regeneration, defined as any later seral conifer species (Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir, or red fir) or hardwood stump sprout or seedling is on the site they will be incorporated into these clusters.



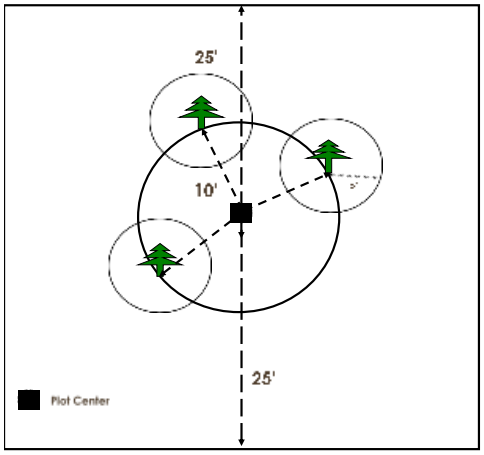
Cluster Diagram

Planting Technique

All planted seedlings will have scalps dug at the time of planting and holes will be dug using either hand-held power augers or hand tools. Other standard planting, release, and thinning practices will apply.

Release:

After successful reforestation seedlings and natural regeneration may need to be released from competition where necessary to promote survival and growth of seedlings. This will be determined through on-site monitoring efforts.
Within the first 1-3 years planted areas will be monitored to determine the need for competing vegetation control. Potential treatment will involve, hand or mechanical grubbing of grasses and other competing vegetation away from the trees in a 5-foot radius circle. (Refer to Figure 4)



Ten Foot Diameter Treatment Area around Each Cluster Planted Tree.